Population structure and multivariate analysis of *Avicennia marina* (Forssk.) Vierh. Pakistan

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Abstract

Mangrove forests are gradually decreasing day by day along the coast of Pakistan due to various known and unknown disturbances. The present studies focused on population structure and regeneration characteristics of mangrove forests in Pakistan with the application of multivariate methods. Twenty eight stands at six different sites were selected for qualitative measurements. A 10 x10 feet^2 quadrats were made randomly and a small quadrat (1 X 1 m^2) was laid inside the main quadrat for quantitative sampling of pneumatophores. The relationships between environmental factors and vegetation were also investigated. The group structure was exposed by an agglomerative clustering technique while major trends were disclosed by PCA ordination. Size class structure of *A. marina* and associated tree species for individual stands exhibited a few gaps. Relationships between tree density and basal area were non-significant while number and height of pneumatophores exhibited significant correlation ($P<0.05$). The overall density of *A. marina* (2960 trees/ha) and *R. mucronata* (3895.43 trees/ha) were more characteristics with basin mangrove stands while density of *C. tagal* (865 trees/ha) lower than riverine forests. The basal area of all mangrove species was closed to dwarf mangrove forests however, tree height ranged between fringe and dwarf mangrove trees. The results of the cluster analysis showed that the six groups of tree vegetation were associated with density/ha and to more or lesser extent with physico-chemical variables. The present study will help in the management and conservation planning of mangrove forests of Pakistan.

Keywords
population structure, regeneration, multivariate, PCA ordination